

Amendment  
Serial No. 09/822,441

Docket No. US010021

**IN THE CLAIMS:**

1. (Currently Amended) A method for estimating retransmission timeout ( $RTO_i$ ) used in a communication system to support multiple retransmission of the same packet between a server and a client, the method comprising the steps of:

- (a) transmitting a plurality of data packets from said server to said client;
- (b) transmitting a negative acknowledgment (NACK) packet for retransmission by said client if one of said data packets is missing;
- (c) computing a round-trip delay ( $RTT_i$ ) corresponding to a latency between sending said NACK packet to said server and receiving the corresponding retransmission of said missing packet from said server;
- (d) calculating a plurality samples of delay ( $\Delta_i$ ) between the reception of adjacent packets of said plurality of data packets by said client;
- (e) determining a smoothed inter-packet delay variance ( $SVAR\Delta_i$ ) based on said calculated delay samples; and,
- (f) computing said  $RTO_i$  based on said determined  $RTT_i$  and said determined smoothed inter-packet delay variance—,

wherein said  $SVAR\Delta_i$  is determined according to  $SVAR\Delta_i = (1 - \beta_1) * SVAR\Delta_{i-1} + \beta_1 * D$  and wherein  $\beta_1$  being set to 0.25 and  $D$  being the absolute difference of  $\Delta_i - SVAR\Delta_{i-1}$ .

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2. (Original) The method of claim 1, further comprising the step of controlling retransmission of said NACK based on said computed  $RTO_j$ , said computed  $RTO_j$  being a delay between subsequent transmissions of said NACK packet from said client to said server.

3. (Cancelled)

4. (Original) The method of claim 1, wherein said  $RTO_j$  is determined according to

$$RTO_j = n * RTT_i + m * SVA\Delta_j,$$

wherein  $n$  being set between 0 and 4 and  $m$  being set to  $m = 4.2792 * n - 2.6646$ .

5. (Original) The method of claim 1, wherein the communication link between said server and said client comprises at least one of a wireless communications link, a wired communication link, and the combination of a wired communication link and a wireless communications link.

6. (Currently Amended) A method for managing transmission of a plurality of data packets over a communications link between a server system and a client system; the method comprising the steps of:

- (a) transmitting a plurality of burst packets from said server to said client;
- (b) transmitting a negative acknowledgment (NACK) packet for retransmission by said client if one of said burst packets is lost;

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(c) determining a round-trip delay ( $RTT_i$ ) corresponding to the actual time between the transmitting said NACK packet by said client and a determination by said client said lost burst packets was transmitted successfully;

(d) calculating a plurality samples of inter-burst delay ( $\Delta_i$ ) between the reception of adjacent burst packets of said plurality of burst packets by said client;

(e) determining a smoothed inter-burst delay variance ( $SVAR\Delta_i$ ) based on said calculated inter-burst delay samples; and,

(f) computing said  $RTO_j$  based on said determined  $RTT_i$  and said determined smoothed inter-burst delay variance;

wherein said  $SVAR\Delta_j$  is determined according to  $SVAR\Delta_j = (1 - \beta_1) * SVAR\Delta_{j-1} +$

$\beta_1 * D$  and

wherein  $\beta_1$  being set to 0.25 and  $D$  being the absolute difference of  $\Delta_i - SVAR\Delta_{j-1}$ .

7. (Original) The method of claim 6, further comprising the step of controlling multiple retransmission of said NACK based on said computed  $RTO_j$ , said computed  $RTO_j$  being a delay between subsequent transmissions of said NACK packet from said client to said server.

8. (Cancelled)

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9. (Original) The method of claim 6, wherein said  $RTO_j$  is determined according to

$$RTO_j = n * RTT_i + m * SVAR\Delta_j,$$

wherein  $n$  being set between 1 and 4 and  $m$  being set to  $m = 4.2792 * n - 2.6646$ .

10. (Original) The method of claim 6, wherein said communication link between said server and said client comprises at least one of a wireless communications link, a wired communication link, and the combination of a wired communication link and a wireless communications link.

11. (Currently Amended) A system for estimating retransmission timeout ( $RTO$ ) used in a communication system to support multiple retransmission of the same packet between a server system and a client system, comprising:

means for controlling said multiple retransmissions of a data packet between said server system and said client system over said communication link based on an actual around-trip delay ( $RTT$ ) and a smoothed inter-packet delay variance ( $SVAR\Delta_j$ ) associated with said client system, said  $RTT$  being a latency between sending a negative acknowledgment (NACK) packet to said server system responsive to a lost packet and receiving the corresponding retransmission of said lost packet from said server, said smoothed inter-packet delay variance ( $SVAR\Delta_j$ ) being variation of delays before and after each received packet or burst of packets, wherein said  $SVAR\Delta_j$  is determined according to  $SVAR\Delta_j = (1 - \beta_1) * SVAR\Delta_{j-1} +$

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$\beta_1 * D$  and wherein  $\beta_1$  being set to 0.25 and  $D$  being the absolute difference of  $\Delta_i - SVAR\Delta_{i-1}$   
~~whereby the over-estimation and under-estimation of said RTO is relatively~~  
~~minimized.~~

12. (Currently Amended) A system for managing transmission of a plurality of data packets over a communications link between a server system and a client system, comprising:

means for receiving said data packets in the form of frame comprised of packets;

means for determining whether any frame packets were lost during transmission;

means for requesting that any lost frame packets be retransmitted;

means for determining a round-trip delay ( $RTT_i$ ) corresponding to a latency between requesting retransmission of said lost frame to said server and receiving the corresponding retransmission of said lost frame from said server;

means for determining inter-burst packet delay variations; and

means for determining a retransmission timeout ( $RTO_i$ ) based on said determined RTT and said determined inter-burst delay variations;

means for determining an inter-burst delay ( $\Delta_i$ ) between the reception of a first packet of said lost burst packets and a last packet of a prior burst packets; and

means for determining a smoothed inter-burst delay variance ( $SVAR\Delta_i$ ).

wherein said  $SVAR\Delta_i$  is determined according to  $SVAR\Delta_i = (1 - \beta_1) * SVAR\Delta_{i-1} +$

$\beta_1 * D$  and wherein  $\beta_1$  being set to 0.25 and  $D$  being the absolute difference of

$\Delta_i - SVAR\Delta_{i-1}$ .

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13. (Cancelled)

14. (Original) The system of claim 12, further comprising a means for controlling multiple retransmission of said NACK based on said computed  $RTO_j$ , said computed  $RTO_j$  being a delay transmission of said NACK packet from said client to said server.

15. (Cancelled)

16. (Original) The system of claim 12, wherein said  $RTO_j$  is determined according to

$$RTO_j = n * RTT_i + m * SVAR\Delta_j,$$

whercin  $n$  being set between 1 and 4 and  $m$  being set to  $m = 4.2792 * n - 2.6646$ .